

QUASAR ORDER CODE 3066 – Thermoelectric Cooler Module

CAUTION! Please read these instructions in full BEFORE you connect any power to the module. All units are pre-tested – NO RETURNS.

HEAT MUST BE REMOVED FROM THE HOT SIDE OF THE MODULE BY A HEAT SINK OR COOLING FAN. IF NOT THEN THE MODULE WILL OVERHEAT & MELT.

Thermoelectric coolers (TEC), Peltier modules, thermoelectric heaters, heat pumps and thermoelectric effect devices - these all refer to the Peltier Effect. In 1834 Jean Peltier discovered that the passage of an electric current through the junction of two dissimilar conductors cools or heats the junction depending on the direction of the current. The modern Peltier junction is made out of semiconductor material. The TEC supplied here has 127 p-n junctions that are connected electrically in series but thermally in parallel. The p- & n-doped elements are soldered to copper connecting strips. Ceramic faceplates electrically insulate these connecting strips from external surfaces. Bismuth telluride is the semiconductor material used.

When a current is passed through the module a water drop placed on one side will boil or freeze depending on the direction of the current. The effect is fully reversible; pass the current the other way & the opposite surfaces will heat & cool. It is important to understand that a TEC is not a heat sponge that absorbs heat. It is a heat pump. Heat which is pumped out of the cold surface is deposited on the hot side of the module where it must be dissipated in some way. If not, the hot side will heat up to the point where it will stop functioning as a cooling device and actually begin to heat the cold surface.

USING THE MODULE The module should NOT be used as it is supplied. The best idea is to bolt metal plates on both sides of the module to protect the ceramic surfaces. Make sure to use heat insulating washers. Modules should not be used as mechanical supporting members of any assembly. This will put unnecessary strain on the solder joints within the module.

A lot of care must go into the construction of the assembly. Metal surfaces in contact with the ceramic plates should be ground flat, cleaned of grit and heatsink conducting paste used to make an efficient contact.

HEAT SINKING The heat sink MUST be considered as an integral part of any Peltier cooling system. All performance characteristics of Peltier devices vary as a function of the heat sink temperature. An ideal heatsink would be capable of absorbing an infinite amount of heat without rising in temperature. In practice we must choose a heatsink which will absorb the total waste heat from the module and not rise in temperature above a tolerable level. In general, a heat sink temperature rise in the range 5 to 15°C above ambient is reasonable.

Heat sinks are rated in °C/Watt. This is a measure of how many degrees the heatsink will rise above ambient when 1 watt of heat is pumped onto its surface. For example, a heatsink rated at 0.17°C/Watt will rise 17°C above ambient when 100 watts of heat is pumped into the sink.

Natural conduction heat sinks (0.5 to 5°C/W) may only just be suitable for some uses of Peltier modules. Forced convection (0.02 to 0.5°C/W) and liquid cooled (0.005 to 0.15°C/W) must be used to obtain the maximum efficiency from a module.

POWER SUPPLY Maximum 13.5VDC. You should use a regulated mains powered DC power supply with the capacity to deliver up to 5 amps and where the voltage can be easily adjusted. Remember to watch out that your heat-sinking on the hot side is sufficient for the application and check the voltage BEFORE connecting the module. (NB A 12V car battery can produce more than 13.5V!).

TECHNIAL DATA

Operating Voltage: Maximum 13.5VDC. Potential may be applied either way. The only difference is the side that heats up and cools down will reverse.

Rating: Maximum 4.4 amps

Power: maximum 36 watts

Temperature difference: maximum 59°C at an ambient temperature of 30°C and with no load.

Number of p-n junctions: 127

Footprint: 40 x 40 mm

Thickness: 4.7 mm

Weight: 28 grams

This module will allow you to experiment with this modern device. There are thousands of uses for heat pumps today especially in situations where heating or cooling must be present in very small spaces - called spot cooling. The other benefits of heat pumps are that there is no refrigerant, no fumes, no mechanical vibration & no noise. Also the amount of heating or cooling can be precisely controlled.

POWER GENERATION So far we have only discussed the Peltier Effect. However, you can use the module to generate power (known as the Seebeck Effect.) At open circuit the module behaves as a simple thermocouple. If a temperature gradient is maintained across the device a potential develops across its terminals. If you maintain the temperature difference and connect the terminals to an electrical load then power is generated. You can experiment with your TEC to generate power in this way.

For our full range of kits see our website at:
<http://www.QuasarElectronics.com>

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